REMARKS

Favorable reconsideration of this application, in light of the following discussion and in view of the present amendment, is respectfully requested.

Claims 1 and 3 are amended. Claims 1-4 are pending.

I. Rejection under 35 U.S.C. § 103

In the Office Action, at page 2, numbered paragraph 4, claims 1-4 were rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,987,591 to Jyumonji in view of U.S. Patent No. 5,980,082 to Watanabe et al. This rejection is respectfully traversed because the combination of the teachings of Jyumonji and Watanabe does not suggest:

> correction means for correcting the positions of the taught points in the operation program based on the determined position or orientation of the object;
>
> moving means for moving an operation tool or a position correction tool attached to a distal end of an arm of the robot at the corrected positions of the taught points;
>
> setting means for setting a jog-feed coordinate system with respect to the corrected positions of the taught points using information from the offline programming system; and
>
> modification means for modifying the corrected positions of the taught points in the operation program based on positions of a control point of the operation tool or the position correction tool, at which positions or orientations of the operation tool or the position correction tool are designated by jog feeds using the jog-feed coordinate system such that the control point takes objective positions for the taught points,

as recited in independent claim 1.

As a non-limiting example, the present invention of claim 1, for example, is directed to a taught position modification device for correcting positions of taught points in an operation program of a robot prepared by an offline programming system, using a visual sensor arranged at a movable part of the robot. The device determines a position or an orientation of an object of operation based on positions of at least two characteristic points on an image of the object captured by the visual sensor and corrects the positions of the taught points in the operation program based on the determined position or orientation of the object. The device then moves an operation tool or a position correction tool attached to a distal end of an arm of the robot at the corrected positions of the taught points and sets a jog-feed coordinate system <u>with respect to the corrected positions of the taught points</u> using information from the offline programming

system. The device thereafter modifies the corrected positions of the taught points in the operation program based on positions of a control point of the operation tool or the position correction tool, at which positions or orientations of the operation tool or the position correction tool are designated by jog feeds using the jog-feed coordinate system such that the control point takes objective positions for the taught points.

Jyumonji discusses a robot system for obtaining two-dimensional image and three-dimensional position information in which a two-dimensional sensor is used for generally detecting the position/posture of an object in a wide range and a three-dimensional sensor for precisely detecting the position/posture of the object in a narrow range in combination. The robot 40 moves from a position 1, which is an approach-starting position, to a position 2, which is an approach position. Then the robot 40 moves from the position 2 to a position 3, the measuring-terminating potion. The position 3 of a terminal point of a path section starting from the position 2 is taught to the robot in advance. The positions of two feature points P, Q of the workpiece W are detected by image analysis using an image processing device 206. Upon completion of movement to the position 1, the robot controller 1 sends a workpiece position detection command to the image processor 2 and enters the standby status ready to receiving the result of detection of the workpiece's positions (the positions of P, Q). Upon receipt of the positions, the robot controller 1 calculates data representing the deviation of the workpiece W with respect to the reference position on the robot coordinate system and then calculates a necessary amount of correcting the robot position.

Jyumonji discusses that an approach position for detection by the three-dimensional sensor is corrected based on the results of detection by the two-dimensional sensor.

As conceded by the Examiner, Jyumonji does not discuss or suggest setting a jog-feed coordinate system with respect to the corrected positions of the taught points using information from the offline programming system and modifying the corrected positions of the taught points in the operation program based on positions of a control point of the operation tool or the position correction tool, at which positions or orientations of the operation tool or the position correction tool are designated by jog feeds using the jog-feed coordinate system such that the control point takes objective positions for the taught points. Thus, Jyumonji does not suggest correcting positions of taught points in an operation program of the robot based on positions of characteristic points set on an image of the object captured by the visual sensor. Although Fig. 11 of Jyumonji shows that the robot 40 is manually operated by jog-feed so that the tool center point TCP moves to the approach position using the image captured by the two-dimensional

visual sensor 30, Jyumonji does not discuss or suggest setting a jog-feed coordinate system with respect to the corrected positions of the taught points.

The Examiner indicates that Watanabe makes up for the deficiency in Jyumonji, alleging that "[i]t would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Jyumonji's robot with Watanabe's et al. robot, because this modification would have introduce a stronger jog-feed features into Jyumonji's robot, thereby improving efficiency and the reliability of the taught position modification device as a whole [sic]". The Applicants respectfully disagree.

Watanabe discusses a robot movement control device in which a teaching point is set in a robot movement control program is corrected to another position using jog-feed buttons. The robot tool is moved by jog-feed buttons using a jog-feed command unit toward a position to which a teaching point is to be corrected. Watanabe discusses that a teaching-point directional movement control means monitors a position of the robot moved by jog-feed, determines the teaching point located nearest to the position of the robot and instructs the jog-feed control means to shift the robot, when it approaches any teaching point in the movement command program, to the teaching point located nearest to the position of the robot. In Watanabe, the position of the tool center point of the robot 4 is monitored in the jog-feed and when the robot 4 is moved to approach any of the taught points, the tool center point is automatically moved to a taught point located nearest the monitored position of the tool center point. The jog-feed in Watanabe is a conventional once using the teaching pendant 40 in which an orthogonal coordinate system or a joint-axes coordinate system is adoptable as a jog feed coordinate system.

While Watanabe does discuss using a jog-feed control unit, Watanabe does not discuss or suggest that a jog-feed coordinate system is set with respect to corrected positions of taught points using information from an offline programming system, where the taught points are corrected based on the position or orientation of the object determined using the visual sensor. Watanabe discusses that after movement by jog-feed to start a shifting control so as to shift a teaching point toward a position to be corrected, if it is determined that the position of the jog-fed tool 12 is within a range of a predetermined radius from any teaching point in the movement command program, the tool 12 is automatically reoriented to the direction as it is programmed in the above teaching point and processing is repeatedly executed until the tool 12 is completely reoriented.

Watanabe does not discuss or suggest that corrected positions of taught points in the operation program are modified based on positions of a control point of the operation or position correction tool, at which positions or orientations of the operation tool or the position correction tool are designated by jog feeds using the jog-feed coordinate system such that the control point takes objective positions for the taught points. Watanabe does not discuss that modification of the taught points are based on positions of a control point, at which positions or orientations of the operation or position correction tool are designed by jog feeds using the jog-feed coordinate system. In contrast, as shown at Fig. 8 and discussed at page 11, lines 15-22, in the present invention of claim 1, for example, "when one or more workpiece portions, corresponding to one or more characteristic points Q1-Q3 of the workpiece model, appear in the workpiece image, the operator selects the workpiece portion in the workpiece image by using a cursor or the like to thereby specify the characteristic point P1, P2, or P3...[and] the processor causes a mark (circle mark, for instance) to be indicated on the characteristic point P1, P2 or P3 in the workpiece image, and stores X and Y coordinate values of the characteristic point P1, P2 or P3 (Step 105)". Thereafter, the X and Y coordinate values are transmitted to the PC, which then calculates the position and orientation of the actual workpiece on the basis of the X and Y coordinate values of the characteristic points and corrects the position and orientation of the three-dimensional workpiece model in the robot operating space and also corrects positions of the taught points on the workpiece model.

Watanabe does not utilize a jog-feed coordinate system set with respect to corrected positions of taught points using information from the offline programming system and does not discuss or suggest modifying the corrected positions based on positions of a control point of the operation or position correction tool, at which positions/orientations of the tool are designed by jog feeds using the jog feed coordinate system such that that control point takes objective positions for the taught points.

In addition, the motivation cited of introducing a jog-feed feature into Jyumonji's robot is not adequate to suggest to one of ordinary skill in the art to set a jog-feed coordinate system with respect to corrected positions of taught points using information from an offline programming system and modify the corrected positions of the taught points in the operation program based on positions of a control point of a tool, at which positions or orientations of the tool are designated by jog feeds using the jog-feed coordinate system such that the control point takes objective positions for taught points. Merely providing that a jog-feed feature would improve efficiency in Jyumonji, which is directed to a system that calculates the deviation of a workpiece W with respect to a reference position on a robot coordinate system and calculates a necessary

amount of correcting the robot position, is not an adequate motivation to suggest combining the teachings of Jyumonji and Watanabe. Use of the jog-feed feature of Watanabe with the correcting features of Jyumonji does not suggest "setting a jog-feed coordinate system with respect to the corrected positions of the taught points...[and] modifying the corrected positions of the taught points in the operation program based on positions of a control point of the operation tool or the position correction tool, at which positions or orientations of the operation tool or the position correction tool are designated by jog feeds using the jog-feed coordinate system such that the control point takes objective positions for the taught points," as recited in independent claim 1.

Therefore, as the combination of Jyumonji and Watanabe does not suggest all the features of claim 1, and as the motivation cited is inadequate to suggest such a combination, claim 1 patentably distinguishes over the references relied upon. Accordingly, withdrawal of the § 103(a) rejection is respectfully requested.

Claims 2-4 depend either directly or indirectly from independent claim 1 and include all the features of claim 1, plus additional features that are not discussed or suggested by the references relied upon. For example, claim 2 recites "display means for displaying an image of a model of the object based on information from the offline programming system, and for indicating coordinate axes of the jog-feed coordinate system in accordance with lines defined by the corrected positions of the taught points in the image of the model." Therefore, claims 2-4 patentably distinguish over the references relied upon for at least the reasons noted above. Accordingly, withdrawal of the § 103(a) rejection is respectfully requested.

Conclusion

In accordance with the foregoing, claims 1 and 3 have been amended. Claims 1-4 are pending and under consideration.

There being no further outstanding objections or rejections, it is submitted that the application is in condition for allowance. An early action to that effect is courteously solicited.

Finally, if there are any formal matters remaining after this response, the Examiner is requested to telephone the undersigned to attend to these matters.

If there are any additional fees associated with filing of this Amendment, please charge the same to our Deposit Account No. 19-3935.

Respectfully submitted,

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